

## Collider Run II Shot Setup Documentation

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**Sequencer:** Pbar

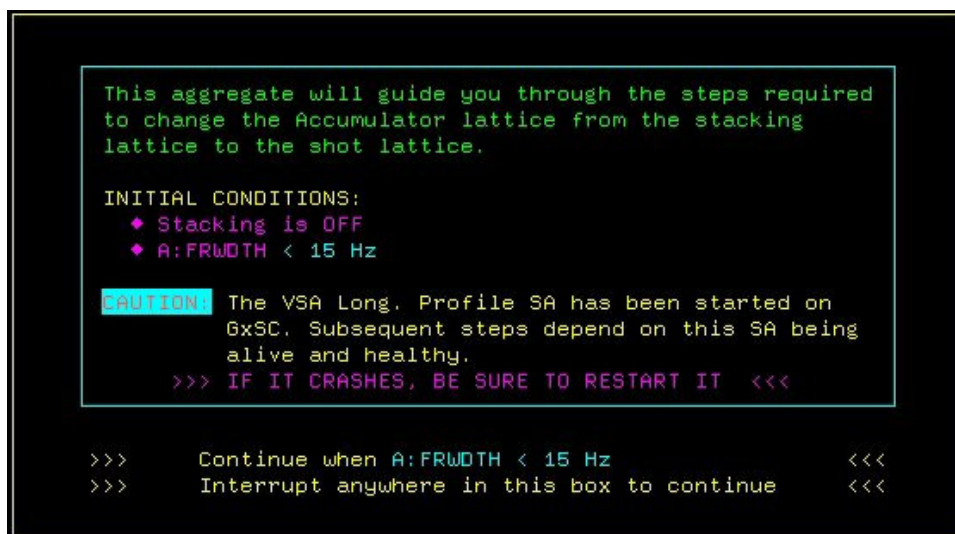
**Collider Aggregate:** Run II Switch to Shot Lattice

**Previous Aggregate:** [Run II Start Reverse Protons](#)

**Purpose of this Aggregate:** The previous aggregates had the Pbar Sequencer operator cool the core frequency width to 15Hz. The VSA longitudinal profile SA should still be running on GxSC. This aggregate will ramp Accumulator bus supplies to the shot lattice.

**How to get back to stacking form here:** If you have not run this aggregate, simply run the [Run II Return to Stacking](#) aggregate to return to stacking. If you have started this aggregate, then finish this aggregate and then run both the [Run II Revert to Stack Lattice](#) and the [Run II Return to Stacking](#) aggregates.

... INSTRUCT 200 .



... SHOT\_LOG COMMENT .

Enters the following comment into the Pbar portion of the shot scapbook at <http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=scrap03>.

**Time-** Accumulator switch to Shot Lattice. The Stack size is ##.#####. - Sequencer

... ALARM\_LIST PBar 44 .

Bypasses D59 list "ACC ANLG"



Click on thumbnail image to view a full-sized version.

... WAIT\_FOR SECS 5 .

... ALARM\_LIST PBar 49 .

Bypasses D59 list "A Q SHNT"



Click on thumbnail image to view a full-sized

version.

```
... WAIT_DEVICE A:FRWDTH .
```

Waits for A:FRWDTH to get to 15 +/- 0.05 Hz.

```
COMMAND: WAIT_DEVICE
nominal      15
A:FRWDTH     7.65      Hz
tolerance    .05      tries needed  5
```

```
... CHECK_DEVICE A:FRWDTH SETTING .
```

Verifies that A:FRWDTH is 14 +/- 1.00 Hz. Displays this information in the message window at the bottom of the sequencer.

```
... INSTRUCT 204 .
```

```
When you continue from this instruct all of the core
cooling will be turned OFF.

A new instruct will then appear telling you to start
ramping to the Shot lattice. There will be another
instruct telling you how to verify the stochastic
cooling setup for the shot lattice.

♦ Bring up P36 CORE_M&B subpage 21 now so that you
  can quickly make the required cooling adjustments
  when ramping is complete.

♦ You will know ramping is complete when A:RMPSEQ = 31.

>>> Once you have continued from this instruct, do <<<
>>> not delay carrying out the procedure of the next <<<
>>> two instructs. <<<

>>> Interrupt anywhere in this box to continue <<<
```

```
... AUTO_PLOT Shot Lattice .
```

Starts a FTP on your console of A:LQ (1170-1270 amps) and A:IBEAMB (0ma - current stack size) over A:RMPSEQ (0-32). This is the plot that the Pbar Sequencer Operator will watch when we ramp to the shot lattice. This plot will not have any data until we actually ramp to the shot lattice later in this aggregate.



Click on thumbnail image to view a full-sized

version.

```
... INSTRUCT 205 .
```

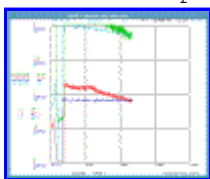
```
You will be prompted to start a new Fast Time Plot of EMT3HN,
EMT3VN, FRWDTH, and CENFRQ with limits appropriate to the Shot
Lattice. Start this plot on an adjacent console, likely #2, and NOT
the 'SA' window! Keep an eye on this plot to ensure that transverse
emittances decrease and FRWDTH approaches its target, currently 22.
For large stacks in particular, it is okay if FRWDTH is not at its
goal, but it should be within a few Hz.

Interrupt anywhere in this box to continue
```

```
... AUTO_PLOT Core Emit Shot L .
```

Starts a FTP on the console of the operator's choice that contains A:EMT3HN

(0-2 pi-mm-mrad), A:EMT3VN (0-2 pi-mm-mrad), A:CENFRQ (628920-628940 Hz) and A:FRWDTH (0-36 Hz) over time (0-1800 sec). Pbar Sequencer Operators normally start this plot on CNS2.



Click on thumbnail image to view a full-sized version.

```

::: SETIT_DEVICE A:VSARST = 0 .
    Changes the VSA Reset parameter from 5 to 0, which turns off the VSA momentum
    thermostat. We don't want the thermostat running when ramp to the shot
    lattice.
::: SET_SEQ FILE 33 .
    File #33 turns off 2-4 GHz Momentum cooling and bypasses the alarms. We
    need to temporarily turn off the cooling while we ramp to the shot lattice.
    A:CPPS01 TURN_DEVICE OFF ok
    A:CPPS01 DIG_ALARM DISABLE ok
    A:CPTW01 ANA_ALARM DISABLE ok
    A:CPTW01 DIG_ALARM DISABLE ok
    A:CPHV01 ANA_ALARM DISABLE ok
::: CTLIT_DEVICE A:CH1PS1 OFF .
    The sequencer is almost ready to ramp Accumulator supplies to the shot
    lattice. The last thing that must be done is the cooling must be turned off
    during the ramp process. This command turns off the Pin Switch for Core
    Horizontal Band 1 cooling. The CTLIT_DEVICE command not only issues an off
    command to the device, but also waits a specified period and then verifies
    that the device is off. The following eight commands turn off other bands
    of cooling.
::: CTLIT_DEVICE A:CH2PS1 OFF .
    This command turns off the Pin Switch for Core Horizontal Band 2 cooling.
::: CTLIT_DEVICE A:CH3PS1 OFF .
    This command turns off the Pin Switch for Core Horizontal Band 3 cooling.
::: CTLIT_DEVICE A:CV1PS1 OFF .
    This command turns off the Pin Switch for Core Vertical Band 1 cooling.
::: CTLIT_DEVICE A:CV2PS1 OFF .
    This command turns off the Pin Switch for Core Vertical Band 2 cooling.
::: CTLIT_DEVICE A:CV3PS1 OFF .
    This command turns off the Pin Switch for Core Vertical Band 3 cooling.
::: CTLIT_DEVICE A:CPPS01 OFF .
    This command turns off the Pin Switch for Core 2-4GHz Momentum cooling.
::: CTLIT_DEVICE A:CMPS01 OFF .
    This command turns off the Pin Switch for Core 4-8GHz Momentum cooling.
::: CTLIT_DEVICE A:CPTW01 OFF .
    This command turns off the Core 2-4GHz Momentum TWT.
::: CTLIT_DEVICE A:R2LLAM OFF .
    This command turns off the stabilizing RF (ARF2).
::: INSTRUCT 203 .

```

P170 (Pbar Ramp Development) will be launched at played on this console by the Sequencer. Make sure that ramp 9 is selected, 'Play Ramps' is displayed, and then continue.

The switch will be complete when P170 terminates.

Interrupt anywhere in this box to continue

```

::: SEQ_PGM REQUEST Shot Lattice .
    Program P170 is started and asked to play out file 9, which ramps Accumulator
    supplies from the stacking lattice to the shot lattice. The below screen

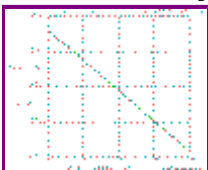
```

capture shows P170 in action. When P170 has finished ramping to the shot lattice, the application will automatically close.



**P170 in action. Click on thumbnail image to view a full-sized version.**

The below fast time plot shows ramping to the shot lattice. The x-axis plots A:RMPSEQ (0-32). P170 starts the ramp at A:RMPSEQ = 0, and increments the parameter by one for every ramp step. When A:RMPSEQ reaches 31, we have ramped to the shot lattice. The plot shows the ramp of the A:LQ power supply and also shows the Accumulator beam intensity at the top of the plot. If any beam is lost during the ramping process, it will be seen on this plot. A Pbar expert should be notified if any significant beam loss occurs during the ramp.



**Ramping to the shot lattice. Click on thumbnail image to view a full-sized version.**

```

::: STEP_MOTOR A:CH1T2 297      .
    Before the cooling can be turned back on, the trombones must be adjusted to
    their shot lattice values. This command moves the core horizontal band 1
    trombone to its shot lattice value. The step motor command moves the
    trombone to its desired value using a feedback loop. The next seven
    commands moved other cooling band trombones to their shot lattice positions.

::: STEP_MOTOR A:CH2T2 338      .
    This command moves the Core Horizontal Band 2 trombone to its shot lattice
    value.

::: STEP_MOTOR A:CH3T2 456      .
    This command moves the Core Horizontal Band 3 trombone to its shot lattice
    value.

::: STEP_MOTOR A:CV1T2 415      .
    This command moves the Core Vertical Band 1 trombone to its shot lattice
    value.

::: STEP_MOTOR A:CV2T2 218      D
    This command moves the Core Vertical Band 2 trombone to its shot lattice
    value. This command is bypassed since there is a tunnel problem with this
    trombone that makes it very hard to move. As a result, we leave this
    trombone at the stacking lattice value and turn it off during shots.

::: STEP_MOTOR A:CV3T2 239      .
    This command moves the Core Vertical Band 3 trombone to its shot lattice
    value.

::: STEP_MOTOR A:CMTM01 252     .
    This command moves the Core 4-8GHz Momentum trombone to its shot lattice
    value.

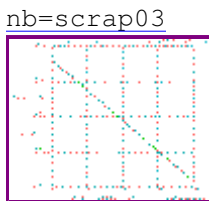
::: STEP_MOTOR A:CMTM01 236     D
    This command is bypassed. If enabled, this command would move the Core 4-
    8GHz Momentum trombone to 236 psec.

::: WAIT_DEVICE A:RMPSEQ      .
    Wait for A:RMPSEQ (PA1917 Ramp Sequence Parameter) to go from 0 to 31. When
    at A:RMPSEQ arrives at 31, we have completed our ramp to the shot lattice.

::: SETIT_DEVICE A:RLFS0 =628930 .
    The core center frequency changes from 628886 Hz to 628930 Hz when we ramp
    from the stacking lattice to the shot lattice. This command sets the
    A:RLFS0 (ARF Synth Frequency) parameter to the shot lattice core center
    frequency 628930 Hz.
  
```

```
... SHOT_LOG IMAGE .
```

Pastes a copy of the "shot lattice" FTP (started above) into the Pbar portion of the shot scrapbook at <http://www-bd.fnal.gov/cgi-mach/machlog.pl?nb=scrap03>



Click on thumbnail image to view a full-sized version.

```
... COPY_SCREEN LCL SA .
```

Screen copy of the local SA window, which is the same fast time plot that the previous command copied to the shot log.



Click on thumbnail image to view a full-sized version.

```
... CHECK_DEVICE A:RLLFS0 READING .
```

Displays present value of A:RLLFS0 in the message window on the sequencer. The value should be 628930 Hz.

```
... SETIT_DEVICE A:RCETA = .025 .
```

ETA parameter set to 0.025

```
... SETIT_DEVICE V:APSLAT = 2 .
```

Sets V:APSLAT state to "stacking lattice."

```
... SETIT_DEVICE A:VSARST = 1 .
```

Tells VSA to restart measurement.

```
... WAIT_DEVICE A:VSA AVG .
```

Waits for A:VSA AVG to be 1 for 15 consecutive samples.

```
... SETIT_DEVICE A:R2LLAM = 1.65 .
```

```
... CHECK_DEVICE A:CENFRQ READING .
```

Checks that A:CENFRQ is 628030 +/- 5 Hz and displays a notice in the message window of the sequencer.

```
... SET_DEVICE A:CNFRQU A:CENFRQ .
```

Sets A:CNFRQU (Accumulator center revolution frequency unstacking parameter) to the current value of A:CENFRQ.

```
... SET_DEVICE A:R2DDS1 A:CNFRQU .
```

Sets stabilizing RF frequency to the core center frequency.

```
... SET_DEVICE A:CNFRQU *= 2 .
```

```
... SET_DEVICE A:R2CWFR A:CNFRQU D
```

```
... CTLIT_DEVICE A:R2LLAM ON .
```

```
... SET_DEVICE A:RLLFS0 A:CENFRQ .
```

```
... SET_DEVICE A:RLLFS1 A:CENFRQ .
```

```
... CHECK_DEVICE A:RLLFS0 READING .
```

```
... CUSTOM COOL_GAIN .
```

Sets core cooling PIN attenuators to values obeying an equation  $mult(i) * (A:IBEAMB) + offset(i)$ . The constants "offset" and "mult" are stored in a table maintained by the AD\Pbar department. Custom cooling gain usually undershoots cooling power for larger stacks.

```
... CTLIT_DEVICE A:CH1PS1 ON .
```

```
... CTLIT_DEVICE A:CH2PS1 ON .
```

```
... CTLIT_DEVICE A:CH3PS1 ON .
```

```
... CTLIT_DEVICE A:CV1PS1 ON .
```

```
... CTLIT_DEVICE A:CV2PS1 ON D
```

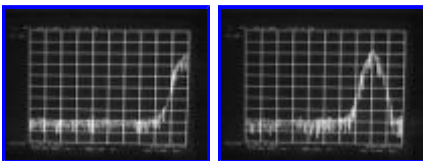
```
... CTLIT_DEVICE A:CV3PS1 ON .
```

```

::: SETIT_DEVICE D:FFTLOF =299.807 .
::: SETIT_DEVICE A:FFTLOF =300.197 .
::: SPECTRUM_LOAD 2 29 .

```

Loads P41 file 29 (Shot Lattice Display) into spectrum analyzer 2. This can be viewed on CATV Pbar channel 28. Since we have ramped to the shot lattice, the

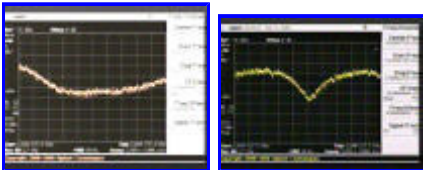


```

::: SETIT_DEVICE A:CMPO1 = 22 D
::: SPECTRUM_LOAD 1 22 .

```

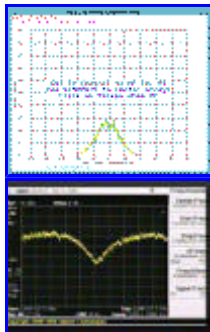
Loads P41 file 22 (4-8 momentum schottky at 5.5 GHz) into spectrum analyzer 1. This can be viewed on CATV Pbar channel 20 and will be used to center the 4-8 momentum pickups on the beam.



```

::: SETIT_DEVICE A:C48RFQ =628928 .
    Core 4-8 momentum reference frequency.
::: SETIT_DEVICE A:C48RPS =-45.97 .
    Core 4-8 momentum reference position.
::: SETIT_DEVICE A:VSARST =3 .
    Initial centering of core 4-8 momentum pickup arrays.
::: WAIT_FOR SECS 20 .
::: INSTRUCT 208 .

```



```

::: WAIT_DEVICE A:VSARST .

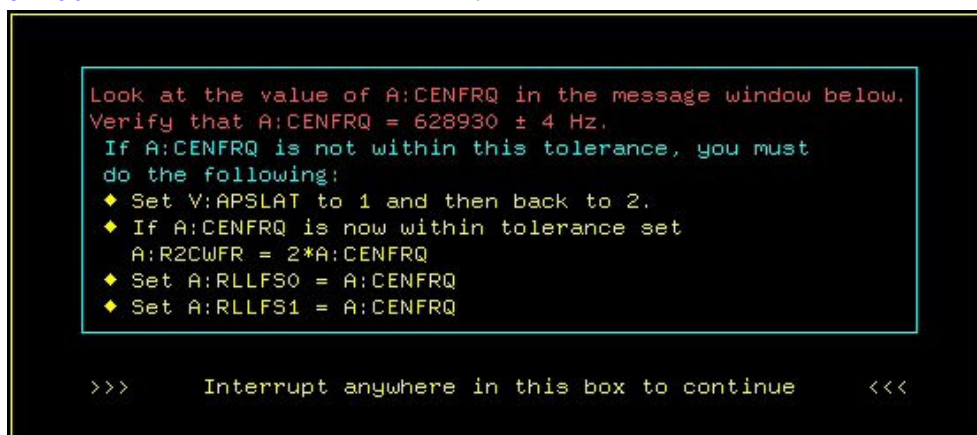
```



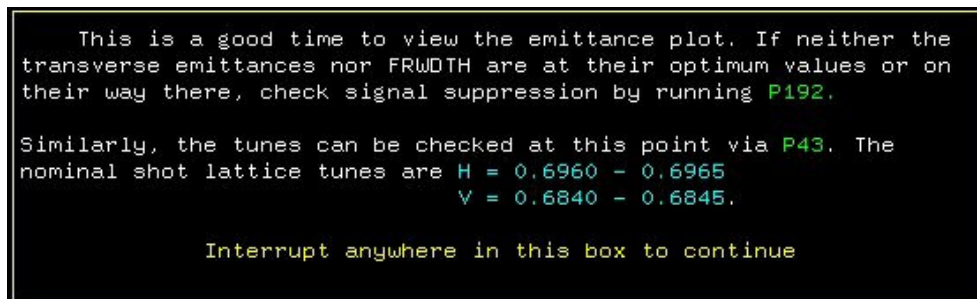
```

        Wait for A:VSARST to go to zero.
::: CTLIT_DEVICE A:CMTW01 RESET      .
::: CTLIT_DEVICE A:CMTW02 RESET      .
::: CTLIT_DEVICE A:CMTW01 ON         .
::: CTLIT_DEVICE A:CMTW02 ON         .
::: CTLIT_DEVICE A:CMPS01 ON         .
::: SETIT_DEVICE A:RLLEXF =628723    D
        Sets the accumulator extraction orbit frequency.
::: SETIT_DEVICE A:RCFRV0 =628930.   .
        Dfrev0
::: SETIT_DEVICE A:VSAFWM =100        .
        Sets maximum accumulator frequency width.
::: SETIT_DEVICE A:VSAFWD =25         .
        Sets desired accumulator frequency width.
::: ACL SET_FROM_READING              .
::: SETIT_DEVICE A:DTMHVE =10         .
        Sets H-V emittance difference for VSA thermostating.
::: SETIT_DEVICE A:R4FSRL = 25        .
        Sets ARF4 frequency skew limit.
::: SETIT_DEVICE A:VSARST =5          .
        Momentum thermostating enabled.    Keeps A:FRWDTH at A:VSAFWD.
::: CHECK_DEVICE A:CENFRQ READING    .
        Checks A:CENFRQ and displays the value in the sequencer message box.
::: INSTRUCT 212                      .

```



```
ok INSTRUCT 209      .
```



Collider Aggregate: **Run II Switch to Shot Lattice** has been completed.

Next Aggregate: Run II Finish Reverse Protons

**How to get back to stacking form here:** If you have not done so, finish this aggregate and then run both the [Run II Revert to Stack Lattice](#) and the [Run II Return to Stacking](#) aggregates.